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is my favorite student in Chicago Medical  
School who may choose to read this story, as  
an example of what we may see everywhere,  
by having our eyes open to surrounding  
life. even among such common things as the  
well known "chinch bug" (Lycophotus lineatipes) it  
found mention in a lecture among the  
archives of the college. by our beloved  
and most esteemed Professor. from whose  
lips we better have received the most  
valuable treasures of their immortal  
science.

Chicago Jan 27. 1886



IX.

Epidemic Diseases  
By Henry Thimer  
Mount Candl  
Candl Co.  
Illinois





Chapter First  
Epidemic Diseases

As Manifested in the  
Animal Kingdom

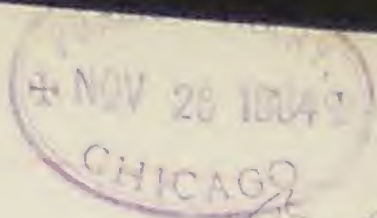
Principally derived  
from personal observation  
of the late Malignant  
Epidemic among  
Insects,



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Section First  
Preliminary Notice of Pygarrus Leucophris  
in health, and disease.

It may seem strange to some that men would stoop to observe the frail creatures of the Earth that creep beneath our feet.

But they are the subjects of the same unerring laws that contrroll the Lords of Creation and we may be enabled to draw from humble sources, the truths we

fail clearly to see in the image  
divine in human form.

Truth from every source is  
worth recording. and he who  
adds but an atom, to the  
already vast accumulations  
of the "Hall of Science"  
if he does not earn a name  
that will place him in the  
front rank of human benefac-  
tors. Still is doing better than he  
who indifferently folds his arms,  
regardless of what yet remains to.



be done, or fearing to launch  
forth in the shadows of the  
towering mountains that the  
giant men of Genius have  
upheaved before him, or still  
more to be nettled, ignorant of  
the fact that all has not yet  
been accomplished. As the  
car of observation rolls on  
new truths will continually  
break forth upon the astenis-  
ed vision of its passengers  
throughout the countless ages of

Eternity. Continuing in one  
uninterrupted Stream to Perfect,  
the unfaiding bliss of him who  
is so fortunate as to secure  
a papage.

Epidemics among men  
are heard of far and wide  
and while we discuss the  
probabilities and endeavour  
to profit by the facts, a tremble  
of perchance it even directs  
its course towards us. as  
when the late much dreaded



Cholera. in its westward  
march across the Continent  
of Europe was again found  
on our own shores. Let us  
not fail to observe the fact  
that Epidemics are hundred-  
fold more terrible to its victims,  
than the Cholera, or the Plague  
has ever been to man within  
historic times, are actually  
raging among the humbler  
inhabitants of Earth beneath  
our feet, and having observed

the fact. let us endeavour  
to inquire into the cause.  
And if as Students of Medicine  
we would not be auth-  
orized to investigate it for  
its bearing upon Science in  
General. yet we may be  
permitted to examine that  
part of the Subject that  
has a Connection Compar-  
atively with the Causes of  
death that are universal  
Among not only men but



all organic beings. And as  
all flesh is heir to the same  
Common fate and Univer-  
sal ruin, we may hope to  
draw some profitable lesson  
even from this humble  
Source —

And as if among men  
we would profitably inves-  
tigate the various Phenomena  
of disease, we must first  
acquire a knowledge of health,  
so in the subject of our present

Epay. we must inquire into  
the conditions of health, before  
we are prepared to inquire  
into the Cause of the disease  
which is the principal object  
of our remarks.

Then we would beg that  
higher grade of Medical  
men who study only for  
the prospect of future gain  
or popularity, who study not  
for the love of it, and no  
more than they actually must



to secure them business; to  
hermit us in our humble  
way to attempt to retire  
behind the dingy curtain  
of scientific obscurity and  
follow the diminutive object  
of our present subject  
into its native retreats.  
Where in the full vigour of  
its development, it so far  
encroached upon the domain  
of even the most unscien-  
tific and careless observer,

as to become an object of  
universal comment and  
hopeless denunciation espe-  
cially among those who, as  
agriculturalists were directly  
affected. The forbidden  
ground once passed May  
we not then as practical  
men and as Pathologists  
all profit by the humble  
lesson which we trust may  
be drawn from this awful  
source.



With the wide spread  
destruction that followed  
the rise and progress of Pygmaeus  
Leucopterus Say, (Rhyphochismus  
Devastator LeBaron) most Western  
men are well, and many  
in pocket ~~and~~ familiar.  
Under the Genial influence  
of a favourable climate it  
attained the maximum  
of its development in the  
Summer of 1864. Whereby  
threefourths of the wheat and

one half of the Corn Crop  
was destroyed throughout  
the entire North-West with  
a loss of more than \$100,000,000.  
in the currency that then  
prevailed. Which if contin-  
ued at this rate for 100  
years. and estimating  
the value of money at the  
legal rates of our state,  
annually, would amount  
to the enormous sum of  
137796 Millions of dollars.



lop to the farming Community alone without estimating the effect of this lop, upon the various associated interests of the Nation, And with its tendency rapidly to spread over the entire Continent. With these combined interests and a rapidly developing Country, it even would be short of the true estimate to place the entire lop to this

Continent at one hundred  
times that Sum. if thus  
perpetually continued without  
interruption. — a Sum  
sufficiently vast to engulf  
the wealth of the world.  
This short digression from  
the Pathological Consider-  
ation of our Subject, may  
be excused for the purpose  
of illustrating the aggre-  
gated effect of so small  
and insignificant a



Creature. Scarcely worth  
the consideration of a Man".  
And at the same time  
showing that all epidemics  
are not deleterious to the  
interests of man.

Its ravages have been  
marked with varying  
paroxysms. From year to  
year for a long time.  
Among the records of which  
it will be seen that  
Mr B. Walsh of Rock Glengale,

estimates the loss in Illinois  
alone in the year 1850 to  
have been \$4.000.000.00 And  
from all insects of every  
kind at \$20.000.000.00 in Gold.  
What fatality produced the  
intervening paroxysms.  
in its progress and devel-  
opment, it was not my  
province to observe

The pleasant dry weather  
of the few years preceding  
1865, which was exceedingly



healthy for every description  
of animal life, in a state  
of nature, and the unob-  
structed breezes of our prairie  
climate. And the snowy pro-  
tection of the winters, intro-  
duced into the fertile  
prairie fields of the North  
West, an unusually large  
and healthy generation of  
them in the full vigor of  
their reproducing powers,  
and the harvestmen found

them in every field, in  
unnumbered millions, in  
the summer of 1864, blas-  
ting the fairest prospects  
of the bone and sinew  
of the land. It weighed  
down the prospects of the  
farmer, upon whom all  
other interests rest as a  
firm foundation, alth-  
ough Selden observed and  
has frequently acknowl-  
edged.



It was my fortune to  
serve them in their devel-  
opment, for years, following  
them by daily observations  
and to see the mature  
generation of midsummer,  
fulfill the great office of  
nature, and lay down  
to die from natural laws  
after the great object of  
their being was accom-  
plished, in the midst of  
their rapidly developing.



offspring, uncared for  
and mostly unobserved.  
Day after day it was my  
greatest pleasure in a  
scientific point of view,  
while I deplored their de-  
vastations, to mark  
the continual progress of  
this vast host towards  
the imago state everywhere  
around me, which with  
the counteracting influences  
that other insects exerted



occupy pages of recorded  
observations of the great-  
est interest to me. Which  
however would be foreign to  
our present purpose.

Having thus seen them  
developed. And in full and  
vigorous health at the close  
of autumn. I saw them  
choose their various local-  
ities of shelter where they instinc-  
tively contemplated braving the storms  
of the coming winter.



With the closest attention  
I failed during the entire  
Summer to observe any  
agency, that in any way  
operated against the increase  
and progress of these insects  
except some of the carnivorous  
insects and birds, among the  
former. The Coccinillidae  
especially. Hippodamia Maculata  
and the Crysope of which a  
new species that I described  
as C. Illinoensis Proceedings  
C.



Entomological Society Philadelphia  
were very active in their efforts  
of Annihilation as well as  
abundant, doubtless proving  
a source of great annoyance  
to them, and from their  
great numbers and voracious  
tendencies led to the belief  
that under favourable cir-  
cumstances they would do  
much towards restraining  
their progress. Still their  
immediate effect on the

vast multitudes of the  
L. Leucoptera that literally  
covered the stalks and blades  
of corn during the day and  
the ground at night was  
not appreciable to the casual  
observer. Neither the heat of  
the sun, the drenching  
rains when they did occur,  
which was but seldom and  
then only in brief showers,  
nor the cold frosts of autumn  
made any unfavourable



impression upon them  
The hottest and driest  
weather. So long as they  
could obtain food was  
their most favourable element,  
it was only at midday of a  
high temperature, and in  
fair weather that we saw  
the imago on the wing,  
and then at midsummer  
after the maturity of the first  
or spring brood, the air swarmed  
with them, not in

congregated clouds like  
the flight of the locust. but  
scattering all through the  
air every where. probably about  
a score of them to the cubic  
foot. Sporting in the sunshine  
and seeking their mates  
and favorable grounds &  
pastures where they could  
fulfill the first great law  
of all organized life - to  
propagate their kind. It was  
quite remarkable too to see



them thus soaring and  
dancing so joyously on their  
frail four winged support, in  
the full vigor of insect health  
pleasure and enjoyment,  
like moats in the atmosphere  
each one enjoying in this  
their season of love, a world  
of inward, emotional pleasure  
Interesting to the farmer  
because this unusual phen-  
omena induced him to  
believe that they had taken

Wings to fly away. for in the  
harvest season then just  
passed they were never seen to  
take wing to escape the most  
eminent danger. as they  
heaped upon the platforms  
of the reapers by the bushel  
Interesting to the natu-  
ralist, because in this season  
of their activity he beheld  
the conditions necessary to  
their fullest development and  
highest enjoyment.



When this their season of  
courtship was ended it was  
farthermore interesting in a  
scientific, though not in a  
pecuniary point of view, to be-  
hold the nuptial embrace  
and all absorbing interest  
that they manifested in the  
act of copulation, all in  
the highest seeming enjoyment  
of health, and indeed it was  
impossible to find any dead  
or dying. The ovipositing,

Season ended at the time  
when the first laid eggs  
began to hatch, when with  
few exceptions the parents died  
leaving the carefully selected  
pastures entirely to their off-  
spring. Neither during the  
entire season of youth could  
we find any of the young  
dying of disease. The weather  
was unusually warm and  
dry. A condition that was  
the most favourable for their



full enjoyment of health  
They skinned themselves  
three or four times in their  
progress from the larval to the  
pupa state. and it was  
this circumstance that lead  
many uncertain observers  
to believe that they were  
dying. especially the Spring  
brood. where they were at such  
moulting times. particularly  
when casting off the pupa  
garment. that they were

often found congregated  
together in bunches often of a  
pint or even of a quart or  
more fulfilling the last office  
that perfected their being,  
in their youthful pulchery  
they came forth white or  
hale red soon to harden  
and blacken in the sun  
leaving their cast off garm-  
ents lying in piles. Among  
these piles I could detect  
none of the dead supposed



to have been observed by  
many

We will now pass what  
we further saw of them in  
their progress and development  
to make a few observations  
on their life during the  
winter recording such facts  
as may seem connected with  
our present consideration,  
especially connected with the  
visible manifestations of  
health and endurance.

before we proceed to the investigation of the Physiological and Pathological Conditions that produced their almost entire overthrow.

In January 1865 I examined those that had chosen their winter quarters in the sheaths of the corn leaves. Such as were above the snow, and had been thus exposed, during the severe cold weather of December With the Thermometer.



15° to 20° Foh. below zero,  
were all dead. from the effects  
of the extreme cold. As the  
winter advanced I occasion-  
ally brought in corn husks  
filled with ice upon thawing  
them found the insects all  
alive and able to run, well  
and apparently unaffected  
by that degree of cold. many  
entirely encased in solid ice  
It will here be observed that  
they possess vitality enough

readily to withstand the effect  
of a temperature below the  
freezing point and perhaps  
near zero. which must have  
been their condition in those  
ice bound husks; but when  
in the open air exposed to the  
sweeping prairie winds  $15^{\circ}$ - $20^{\circ}$   
below zero for a long time  
they succumbed to the cold.

March 7<sup>th</sup>. — The snow having  
cleared off from the ground  
I examined the condition of



a host of them that had  
Chosen for their winter covering,  
Ced wood sticks lying on the  
ground, entirely surrounded  
by frost and ice of these 20 per  
cent were living. Of these I  
housed a number in more  
comfortable quarters in the  
house, but was surprised  
after one month to find  
them all dead. While those  
that remained out hopped  
the month of March without

any farther injury.

Those that had selected more eligible retreats fared much better during the winter, from the fallen leaves of an apple tree I found over 50 per cent of them alive and well and able to travel so rapidly that I experienced some difficulty in being able to count them before they could make their escape. as they were warmed to activity around the stove.



From a single hand-full  
of these leaves taken up  
without selection I counted  
355 living & 312 dead.

The entire month of March  
was extremely variable, alter-  
nating almost daily with  
rain, snow, freezing and  
thawing, seeming to be very  
uncomfortable for any  
living being. To remain out  
of doors on top of the ground  
with so poor a shelter,

but from the first to the  
10th of April when I  
again examined them I  
found about the same propor-  
tion of living S. Seueoptera

At this time they were  
leaving their winter quarters  
to seek food.

May 16<sup>th</sup> 1865 I observed  
the same phenomena that I  
had occasion to note last  
summer — the spring  
season. They were very



numerous filling the air  
in the same way as they  
did last summer. and  
appearing almost as nu-  
merous, spouting in the  
mild atmosphere and  
brilliant light of the sun  
at meridian height of that  
unusually beautiful spring day.  
(More intelligent beings might  
learn here a simple, nat-  
ural and profitable lesson  
from these minute insects,



that conduct their Courtships  
under the searching gaze of  
the noon day Sun. instead  
of the (midnight hour)  
Two days after this I saw  
them in great numbers in  
the wheat fields — their fa-  
vourite pastures and breed-  
ing grounds. From this time  
on I closely watched with  
the deepest interest the  
progress of Generation, as  
under the most favourable



Circumstances of fine day  
weather it was conducted.  
This occupied one month  
during which time I observed  
much in the highest degree  
interesting and new to the  
more inquisitive after the nat-  
ural history of the insect.  
but as this is not the object  
of this paper, I must withhold  
them as foreign to my present  
purpose and tedious to those  
who may read this Essay.



From June 10<sup>th</sup> — 17<sup>th</sup> the  
young appeared in great  
numbers, with all their char-  
acteristic activity, and the  
parents having completed the  
last great object of their life,  
died quietly on the field of  
their labours.

During the last of June  
all of July and August  
it was ~~very~~ rainy. The greater  
portion of this time the  
atmosphere was very cold



and damp, toward the  
latter part of July the  
insects approached the period  
of their maturity, it was at  
this time that I first saw  
the effects of disease among  
them. About the first week  
of August the epidemic  
was at its height. they died  
with the most amazing rap-  
idity. far transcending  
anything recorded relating  
to the plague, cholera or any



the scourge among men  
and animals since the world  
began. At length the weather  
became warmer, but still  
continued wet. The plague  
still rages among them with  
unabated fury: the dead  
on every farm not only  
amounting to hundreds  
and thousands but innu-  
merable millions. inasmuch  
that it became a matter  
of common observation



among the farmers. Who  
frequently spoke of their dying,  
many not inquiring into the  
Cause further than to rejoice  
over their ruin. others referred  
the malady to a direct divine  
interposition. A medical man  
of great reputation said that  
the "waters were medicated" for  
the purpose by some unseen  
hand. another that it was  
Cholera. While many ridiculed  
the idea of inquiring after the Cause,



Thus the fearful Epidemic  
Raged not only decimating  
the ranks of the immense  
hosts, then numerous as  
the "lice of Egypt," during the  
"plagues of Pharaoh", but  
continuing unabated  
untill, the first of September,  
when it was difficult to  
find any of them remain-  
ing alive. The disease  
attacked them first on  
level low wet ground



In the latter part of July  
in such localities they  
were all dead, and the  
disease spreading with  
alarming rapidity on  
the hills and high Prairies  
All ages suffered the same  
fate. larva, pupa, and imago  
all suffering apparently  
from one common malady  
— involved in the same  
terrible epidemic, "uncared  
for", "unattended", "without



Medical aid".—engulfed  
in one common vortex of  
irretrievable ruin. And so  
far as I have been able to  
learn but one man in  
the entire North West  
paid them the "daily visit"  
of a mile a more.

They died without having  
prophogated.

On the first of October  
when I was obliged to leave  
the locality of my observations



it was exceedingly difficult. after hours of the closest search to produce one alive.

## Section Second Etiology & Pathology

In endeavouring to inquire into the cause of this great Epidemic we find ourselves entangled in a maze of difficulties

The minuteness of our objects precludes the possibility of the usual methods of Diagnosis



practiced among men and  
the superior animals.

But reasoning from  
what we know we must  
conclude that the causes  
of death in every division  
of the animal ~~Kingdom~~  
are referable to natural  
laws, and may be arranged  
under two principal heads.

First:— Causes of death  
from a healthy, quiet term-  
ination of all the functions of  
life. In old age



Second:— Causes of death  
from disease.

Which for our present  
consideration we may be  
permitted to arrange in  
the following manner,  
not as a Scientific clas-  
sification of disease in  
general but for the purpose  
of briefly considering the  
Cause of the Epidemic  
under consideration.

# Diseases of Animals.

First:— from causes acting  
from within.

Imperfect equilibrium  
of the Physical organization  
and vital functions,  
Either hereditary or as  
acquired by the indi-  
vidual, passively.

Exceptions { Appetites. Passions. and  
imperfections acquired  
actively.

Defect of Function

Exceptions



Secondly, - from causes acting  
from without.

Accidents.	{	From Enemies
		Deficient food.
Social Causes.	{	Perverted food.
		Poisons in food.
Cumulative Causes.	{	Warfare.
		Animal Poisons.
	{	Vaporized { Mineral.
		Poisons { Vegetable.
Forces of Nature	{	Impalpable agents.
		Abnormal atmos- pheric Conditions.



It needs no lengthened arguments to prove that the great object of all animal life, in the individual or any single generation as we comprehend it is the propagation of the species, and therefore that death cannot occur from healthy natural causes among men the highest type of earthly life. perfect as he is of immortality.



much less among the lower  
animals that do not attain  
to this boon. untill this  
work has been accomplished  
on the full period of capacity  
has passed away. When  
after a long well spent life  
all the functions of the body  
gradually come to a termination,  
and death is a simple  
result of rest of those nerve  
forces, and vital functions  
that during the entire period



of life. like faithful sentinels had never for one moment quitted their post. Such a termination of life is more frequently observed among the lower orders of life than among the nature violating animal in the human form. Death from healthy natural causes cannot supervene in any form of life before the period of maturity has been attained

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otherwise its species becomes  
extinct and the original  
object of its creation meets  
a speedy termination.

And it may not occur  
for a long period of time  
after this office has been  
fulfilled. This subsequent  
period has a duration—  
measured by some pecu-  
liar and not well under-  
stood, laws. Connected  
more intimately with



Specific conditions of being,  
than with general laws gov-  
erning organic position. For  
man this latter period is in  
well ripened age equal to  
the primay, allowing the  
period of infancy and the  
generative period to be  
45 years. and the whole dura-  
tion of life 80 to 100 years  
giving an average of life  
for the perfect physical  
organization at 90 years.



When the forces of life may  
calmly, and healthily sub-  
side into the everlasting  
sleep of death. This we oc-  
casionally, though rarely wit-  
ness in man, and may  
be clasified as a healthy  
termination of life, — a  
healthy death, because it  
fully harmonizes with the  
demonstrable perfection  
everywhere manifest in the  
great original plan of



creation, witnessed in  
the construction of organic  
life in general. and frequen-  
tly observed among the lower  
orders. While man thus  
prolonges his life to double  
the period of ~~the~~ termina-  
tion of the generative peri-  
od. We find the different  
divisions of the animal  
kingdom extremely—  
variable in this particular  
The Ephemera is born



from the long dark period  
of its larval life, of three  
or more years spent beneath  
the ground, in the evening  
to die in the morning, "tarrying  
but a night," in the perfect  
form. — dying immedi-  
ately after the great object  
of life is accomplished.

We thus behold two great  
extremes in the duration  
of life, after this great  
natural office has been



accomplished. But by  
close observation we may  
find these extremes still  
more marked between  
animals more nearly related  
than those already referred  
to, as for instance the  
following examples compared  
with the Ephemeral  
insect. I have in my  
possession at the present  
time, January 27<sup>th</sup> 1866,  
Several living specimens.



of Doryphora lineata say  
which spent 30 days in  
the larval and pupa state  
(infancy). and 68 days in  
the active period of Genera-  
tion. They have now already  
spent 150 days in old age  
with a prospect of continuing  
alive untill next summer  
thus riveling man in  
the perfection of their regen-  
eration and hence only of  
vital functions, if the duration



of old age can be taken  
as a standard of Com-  
parison. and for aught  
we can see is as good  
a standard of Comparison  
of perfect organization, and  
vital affinity as any other  
within our reach.

This class of observations  
demonstrate one highly  
important fact, that there  
is a period, peculiar to every  
species of animal, at which



with a well rounded age  
death steps in as naturally  
and as welcome as  
peaceful sleep.

The innumerable hosts  
of Bygones Leucoptera  
fell a victim to the king  
terrors before this great  
period, that of genera-  
tion had been reached,  
of this I am positive. From  
the most thorough and care-  
ful observation, and knowledge

of its habits, it therefore  
becomes clear that they  
were victims of a violent  
death — an Epidemic

We must therefore search  
for the cause among  
the diseased instead  
of healthy actions.



Diseases acting on  
the Physical organization  
from causes within  
the body.

Confining our  
investigations to this  
immediate generation  
with which we have to  
do in this dispensary  
we may conveniently  
divide this branch of  
our subject into  
two classes.

First; - from imperfect equilibrium of the Physical Organization and vital functions either hereditary or acquired by some abnormal action or habit of life of the individual. not constrained or influenced by outward circumstances.

Second. Excesses in the exercise of the appetites and passions.



Just:— that there was not  
an imperfect physical organiza-  
tion derived from parents  
we know from the obser-  
vations already briefly referred  
to. which we learn from  
the favourable circum-  
stances under which they  
were developed the preceding  
year. and from the freedom  
of their activity during  
every period of their existence  
in selecting proper retreats



wherein to pass the winter,  
the natural vigor and activity of life so fully manifested at any time during the winter, when placed under favorable circumstances, and in the spring by discharging every office of their being in the most perfect manner, in providing for all their individual wants, and in carefully surveying the country, true to their



instinct, and in selecting proper localities for the breeding places of their young, and for the period of one month depositing them in the places thus selected.

A careful examination of the young also proved them to be of the usual type. They were in a state of unrestrained nature upon the plants of their parents first choice on which they



from year to year had developed in the highest degree of perfection and for aught the most accurate and anxious observer could by any means of information conclude, would continue thus increasing in perfection perpetually.

The perfection of the vital functions of the parents, is beyond doubting



When we remember the  
history of the preceding  
winters through which  
generation after generation  
<sup>passed</sup> ~~passed~~ increasing in per-  
fection and number,  
and that the last winter,  
that of 1864 & 5, was one  
more favourable from  
its unusual mildness  
and excellent protection  
by snows etc. The great  
numbers that passed through



the winter safely was a result of the unusually favourable protective conditions of the winter.

The functional activity of parents was still further manifested in the highest degree from the unusual destruction caused to the growing crops in the spring in providing for their own sustenance during the



period of oviposition.  
This fact was a matter  
of common observation  
everywhere, because in  
many places the rather  
limited wheat grounds  
was so filled with them  
that the parent insects  
destroyed from one fourth  
to one half of the young  
wheat plants, and no  
field within the scope of  
my observation but suffered



greatly from this source  
never before, in any previous  
year, within the period of  
my observation and infor-  
mation from diligent inquiry  
was there such a destruction  
of the small wheat plant  
in the spring, by the parent  
insects. Thus the vital  
activity of the parents  
was fully manifested  
The unusual numbers  
of them explains the



fact of the young plants  
being so unusually injured  
by them

Their reproductive  
powers were ample to which  
a host of their progeny  
readily testified. The young  
were developed in the  
egg, brought forth, and  
for a time nurtured  
under the most favorable  
circumstances of food  
and climatic conditions



A most thorough  
and Carefull. general  
and microscopic Observation  
of the eggs from day to day  
(during which the various  
changes of the developing egg  
was noted) and of the  
young as they came  
forth, is the best and  
most positive testimony  
that can be required of  
the normal perfection of  
the young in every way



4  
Their full normal activity is the most unmistakable evidence of the perfection of both physical organization and vital functions of the young.

From this careful observation of the habits and observed perfection of both larva and imago we must conclude that they inherited both a perfect physical organization and vital



affinity, and that with  
favourable surrounding  
circumstances could  
develop to the highest degree  
of insect perfection.

### Grapes of Appetite & Factions

It cannot be presumed  
that these insects in a  
state of nature should  
all of them, with one  
simultaneous impulse  
be driven to the destructive



gratification of Appetite  
while all previous generations  
had no such failings

Papians they had none  
to gratify in their simple  
state of nature and  
undeveloped youth.

We come now to  
consider the causes acting  
from without that may  
have produced the epidemic  
that destroyed so numerous  
a race of being in such a



brief period of time.

First: Natural Enemies

These could have been readily observed, unless they were microscopic. A few Coccinellidae and Crysopa of the species already referred to as prey on them in great numbers in the previous year, attracted my attention, but not in numbers to make any appreciable effect on the multitude.



If microscopic enemies—  
were present they failed to come  
under my observation, by  
examination, and in the  
absence of positive testimony  
when properly sought for,  
together with the suddenness  
of the attack, we would  
feel no more justified in  
imputing the disease to this  
Cause than we do the  
various epidemics that from  
time to time affect the...



higher animals and even  
man himself.

It is true that we have  
associated with this idea,  
that "animalcule tribes"  
are the active cause of  
epidemic diseases. the  
immortal names of  
Linnaeus, Sir H. Holland  
Dr Koenig, Dr Williams  
and a host of others

While we greatly revere  
the names and the



works of these great leaders  
in science it may not be  
inappropriate to examine  
their mere Hypothesis by  
asking ourselves a simple  
question. If these num-  
erous animalcula in  
the atmosphere gain  
access to the blood or other  
parts of the system, and  
there as is supposed, propagate  
their species for a limited period  
of time. Why do they not



Continue to propagate  
untill the organization  
is destroyed? As for Example  
the Chique (Pulex Penetrans)  
Tickina Spiralis and other  
parasitic insects, in the  
human body, producing  
serious injuries, lameness,  
foul and malignant ulcers  
and intractable diseases  
requiring amputations,  
and even destroying life  
itself.



## Deficient Food

Although this from year to year may cause the death of many of these insects, from the fact that the food plant on which they are placed by the parents always fails if not from destruction, from ripening before the imago state is attained. Yet most of them make safe journeys to abundant



supplies of food.

It is certain that many perish in these long journeys on foot. When the ground was almost literally covered marching in every uncertain direction, many must have failed to find, at least, choice supplies, but accidents of this kind are repeated from year to year, and form part of the natural history of the insect



I have frequently seen  
them take journeys of a  
week or more in search  
of fresh fields & pastures;  
when the original supply  
failed them, as it does  
every year before the period  
of maturity is reached.

It is not with these more  
unfortunate that we have  
to deal. in our investi-  
gations of the present epi-  
demic but with those

owned huts that offered  
advantages for  
wild - but fully equal  
those of any previous  
regarding the abundance  
of food: and more especially  
the great mass of my  
observations were made  
in cornfields, close to the  
hut, where their natural  
food was plenty and of  
the choicest kind and which  
they were perfectly contented



juvailed hosts that obtained advantages for development fully equal to those of any previous year. Regarding the abundance of food; and more especially where the great mass of my observations were made in cornfields, close to the wheat, where their natural food was plenty and of the choicest kind and with which they were perfectly contented



## Perverted Food

I can see no good reason why on this particular occasion more than at any preceding period in at least a number of previous years the natural food plant should become a poison, it must however be admitted that rust mildew &c may have a deleterious effect upon the insects.



it feed upon the grain.  
However did not observe  
any unusual manifestations  
just yet, except a ~~large~~  
number of black, smutty,  
and blighted heads of  
grain.

At the same time the  
insects which were not only  
migratory feeders on the  
adjacent corn, but some  
that from the larval  
state had fed entirely on  
S.

Sweet corn, and that  
were objects of my special  
observation. With a view  
of determining other facts  
in their natural history,  
met the same fate.

From this we therefore  
conclude that the food  
was neither perverted  
nor so materially poisoned  
as to be the efficient  
cause of the disease.



# Social Causes

Of the social causes of death of the animal body the first, Warfare belongs to a more noble race of beings, and is a business of a more exalted character than such insignificant creatures are permitted to enjoy.

We then have only to inquire into the effect of the social compact as developing



Animal Poisons.  
as is well known to be the  
result of overcrowded ten-  
ements. Ships, Cities and  
encampments developing  
Malignant Typhus and  
other fevers. Cholera &c. as  
was supposed in the late  
origination of Cholera,  
from overcrowding, filth,  
and decomposing sacrifices,  
among the pilgrims at  
Mecca. And various



other epidemic diseases,  
with which the world  
has been scourged from  
time immemorial

The cattle disease  
now raging in Europe  
is another marked example  
of the development of  
epidemics from animal  
poisons, originating as it  
did in the poorly ventilated  
stables of northern  
Russia.



These insects however  
were entirely in the open  
air, and thus enjoying  
the freest purest breezes  
that the wide open  
prairies of Illinois  
could afford. The high  
as well as the low lands  
were successively swept by  
the same beneficial influence,  
Furthermore those to which  
I already alluded as feeding  
on the sweet corn in the



village were at the distance of about a mile from any great number of them in wheat fields. and there not very numerous. so that the pestilence which at the same time attacked them also, could not have originated among these few in the corn from animal poisons. and could not have been communicated from the



neighbouring fields.

The more improbable  
does it appear that the  
entirely efficient cause of  
the disease could have  
been animal poisons  
from the presence of num-  
bers. When we reflect that  
other insects in the  
immediate vicinity were  
entirely exempt from  
disease

I also have good reason



neighbouring fields.

The more improbable  
does it appear that the  
entirely efficient cause of  
the disease could have  
been animal poisons  
from the presence of num-  
bers. When we reflect that  
other insects in the  
immediate vicinity were  
entirely exempt from  
disease.

I also have good reason



for supposing that other  
insects in remote localities  
were affected in a similar  
manner, two other species  
at least which I will  
notice hereafter.

I also observed other  
species of insects passing  
through the same social and  
climatic influences entirely  
exempt. One of which a  
very remarkable incident  
may appropriately be mentioned



In the very same corn  
during the height of the  
epidemic. Aphids appeared  
in such countless numbers as  
to entirely cover the top of  
and more tender parts,  
developing with amazing  
rapidity at the same time  
when the Sycaeus Seuceptus  
were suffering the most severely  
from the plague.

Many other insects were  
in the fullest enjoyment of



health in the same regions,  
and upon plants fully as  
liable to be diseased.

These facts are worthy  
of consideration. and may  
lead to important prin-  
ciples in nature — truths  
having a direct bearing  
on the laws governing  
the animal organization.  
Either demonstrating that  
all are not subject to the  
same influences, or that



one species of the same  
class of the animal king-  
dom destined by nature to inhabit  
the same climate and feed  
upon the same or similar  
plants. has superior powers  
of endurance over another,  
or what is still more prob-  
able, a proof of some  
powerful and wonderful  
effect developed by some  
apparently very trifling  
circumstances.



15  
The Aphid was located  
on the tops of the corn  
while the L. leucoptera were  
near the ground and  
happed the night. and cold  
days on the ground, only  
the more nearly matured  
ones being ever found above  
the middle of the stalk,  
and thus not so freely  
exposed to the light and  
warmth of the sun and  
Equilibrium of the atmosphere.



And above all this what  
was far more important  
still, the Aphids only appeared  
after the Epidemie had  
passed the climax among  
the L. Leucoptera, and  
although the epidemie  
was still raging with  
great violence, yet the  
inducing cause may have  
so far subsided as not to  
effect a new set of healthy  
beings introduced among



them at this particular  
junction. It certainly was  
extremely interesting to see  
the aphids in such great  
numbers, in all stages of  
their development, enjoying  
life apparently in the  
highest degree while the  
L. leucoptera, insects of the  
same order (Hemiptera)  
and feeding on the same  
plant, were perishing beneath  
their feet, from the influence,



of some potent invisible  
Cause. The aphidizing  
of a more delicate organ-  
ization it would be expected  
that under the influence of  
the same causes the effects  
would be more readily  
manifested. Its method  
of securing nutriment is  
the same. by piercing the  
plant with an aphid-  
like proboscis. and sucking  
the juice. It develops to



maturity with a much  
greater rapidity and in  
this respect alone does it  
appear most material  
to differ in its general  
habits from S. leuceptera  
yet we here see the one  
developing to maturity in  
a perfectly natural manner  
while the other immediately  
beneath it, on the same  
plant is dying with a  
fatality unparalleled in the



history of animal life,  
unless we admit the supposed  
universal destruction of all  
animals, at the close of  
each Geological period.

This very remarkable  
phenomenon, might appear  
very difficult to comprehend  
by a single observation. But  
when we follow the subject  
daily during a long  
period of time, as we always  
in all cases should do to



make an approximation to a reasonable conclusion, then that which might appear very obscure under a single observation, appears surrounded with fewer difficulties, as we hope to be able to demonstrate in the proper place.

As the Affix appeared toward the close of the Epidemic among the



S. leuceptera. their wonderful exemption might lead us to ask ourselves the question. With a good deal of propriety, are the now dying S. leuceptera, suffering from the effects of a cause that has nearly passed away? We have good reason for thinking that they are. We well know that the seeds of a disease sown, and finding a lodgerman, may be



"gathered many days hence"

The impress of the poison being so malignant that there was no escape from its effects even after healthful surrounding conditions were established. And furthermore, it is one of the rare opportunities that we enjoy of demonstrating that even insects are subject to sickness perhaps occupying long periods of time as well as man.



## Climatic Causes

The consideration of the climatic causes that may have been productive of this epidemic is the most difficult as well as the most important part of our investigations. Here we have embodied the cause, after which we are searching. But at the same time we encounter the same difficulties that



have always envired  
the investigation of the  
mysterious causes of many  
Epidemics that have visited  
the Superior race of Earth's  
inhabitants.

But having clearly Elim-  
inated all the preceding  
causes. Capable of indepen-  
dently producing death. in  
their application to this  
Epidemic. We proceed Con-  
fident that if we do not.



Succeed in clearing away  
the veil of mystery that  
surrounds this department  
of pathology. We still have  
here the concealed cause—  
"the diamond in the mine"  
To remove it many able  
minds have laboured in  
vain. and another failure  
will but be adding one  
more effort to the field  
of fruitless speculation and  
ultimately to the great ocean of  
oblivion.



## Vaporized Poisons

First. those of a mineral,

Second. those of a vegetable origin. have been classified among the diseases producing and consequently among the death causes.

The former is circumscribed in its effects, in the popular acceptation of the term Mineral to the localities of mines, manufatures &c. (Although all things inorganic strictly speaking

do.



are minerals, air & Water  
included,) and in that sense  
only are we required to con-  
sider them for our present  
purpose. They were not in  
proximity and consequently  
not the cause of the Epidemic  
or were the "waters medicated"  
by the Divine power for  
the purpose of destroying  
them. Believing, as we do,  
that the Supreme Author  
of all things has implanted



a higher law in nature  
than that of Special interference  
A law perfect in itself, — a  
law that produces the effect  
from the cause, in all the  
working plans of the Universe,  
with an unswerving course,  
as truly, as perfectly, as  
rapidly, as the ponderous  
wheels of time. Roll steadily,  
— A law that is the perfection  
of all laws. — a law that  
needs no revisions, repeals.



or amendments and  
special interferences, - a  
law that confers the  
highest glory upon the  
great Originator. and in  
the best possible way, serves  
the various purposes of all  
his Subjects. we cannot  
with a commendable  
zeal to arrive at the  
truth, allow the conclusion  
to rest on so improbable an  
hypothesis.



Second, — Vegetable Poisons  
floating in the vapour of  
the atmosphere. Upon this  
as a cause of disease and  
death many able Essays  
have been written. Still  
a dark cloud of mystery  
envelops the subject.

But gloomy as these mists  
appear let no one falter  
in his attempts at investigation  
or hesitate to add another  
whisk to the breeze that at



Some time in the future will  
have so accumulated as to  
scatter the curtain of darkness  
that so effectually environs this  
department of Pathological  
Research.

It is a well admitted  
fact that a certain mysterious  
agent, is in some way developed  
by, or connected with dead  
vegetable matter. Subjected to  
certain conditions of temperature  
and moisture. does produce



disease and death of the  
animal organization, espe-  
cially man. This with as  
much of fancy as demonstra-  
tion has been conveniently  
styled Teimotic poison —  
a ferment, which though  
not observable is ranked with  
the same class of agents in  
nature, as the yeast plant.

It is thus very convenient  
in various other departments  
of science to have some mysterious



explanation of that which  
we do not know — a "scape  
goat" by which the man of  
scientific pride, who would  
give some explanation for  
every result, can obscure  
his ignorance. It may  
however be pleasant and in a  
measure satisfactory to have  
some explanation of the  
mysterious agents and oper-  
ations in Pathology  
Chemistry, Medicine &c.



however erroneous and unfounded they may appear to be in the sunlight of future discoveries

How many chemical and perhaps mechanical phenomena in the body and out of it. Not well understood are explained by the so called catalytic action.

As in the use of Murex in the human body, it has had a long and generally popular



use. Certain desirable results  
frequently follow its judicious  
use. Yet ask the wisest of  
Medical Philosophers how it  
accomplishes the work, and  
instead of simply saying he  
does not know, he tells you  
it is by Catalytic action, and  
perhaps a theoretical explanation  
without a demonstration.

To this there can be no  
serious objection while it does  
not prevent us from prosecuting.



our investigations. ever  
keeping before our minds the  
fact that observation will  
in all cases, in due time,  
lead to all truth. and every  
true observation, however humble,  
should be brought forth as an  
aid to the Philosopher who  
at some future time may  
eliminate the truth.

Observing, seeing is the only  
way of knowing, is the only reli-  
able foundation of correct reasoning.



This imponderable non cog-  
nizable agent in marshy  
districts is. denominated  
effluvium, miasma, malaria  
bad air, aerial poison, fungus  
growths, microscopic plants &c.

The degree of success that  
has attended these explana-  
tions is evident in the fact  
that as much obscurity veils  
the truth as when they were  
first proposed. When this we  
will only entertain a few thoughts



in connection with this  
division of our subject. Refer-  
ring for a more complete  
discussion to the proper  
place in a succeeding  
Chapter.

We find among leading  
authors two principal theories  
to account for the production  
of a peculiar effect upon men  
and even animals. at certain  
seasons and localities when  
heat, moisture and decaying



Vegetation are present.  
First — dead decomposing  
vegetable matter, in imper-  
ceptible minute division in  
the Atmosphere.

Second — Living infinites-  
imal fungus growths somehow  
impregnating the atmosphere.

If either or even both of these  
theories are true, have we  
still in them an efficient  
Cause for the epidemic of  
1865 among Syngaeus leucopterus,



In the first place as  
heretofore observed we find them  
affected on the high as well as  
the low grounds. although later  
in their season on the highlands.

When we consider that some  
other species of insects very  
numerous did not suffer from  
the same cause. we do not find  
here an explanation entirely  
satisfactory to the adoption of  
the hypothesis. without a more  
mature consideration.



It is a well attested fact  
by everybody throughout the entire  
north west, and long to be rem-  
embered by many that Mosquitoes  
(Culex pikiens) were not seriously  
injured by this or any other  
disease, except want of "maeklood",  
during the summer and autumn  
of 1866. and of that they man-  
aged to secure more than con-  
tributed to our comfort.

Now, as is well known, they  
were developed on the lowlands,



in marshes &c, where they  
would become exposed to  
these miasmatic influences in  
the fullest degree possible, first  
in the larval state in the  
water, where the miasma may  
be supposed according to the  
best authorities to be most  
plentiful, and secondly in  
the mature state they are  
found more abundant in  
these malarious localities than  
on the high lands.



and for all that I was  
able to observe enjoyed a  
degree of health that was  
quite annoying, even with  
the slight acquaintance that  
I formed with them. Many  
other examples of a similar  
character might be produced.  
While on the other hand we  
found something operating  
destructively on not only L. leucosternus  
but many other insects among  
which we will only refer to the



larvae of Galeruska vittata  
and Saehnosterna fusca,  
coleopterous insects. both of  
which were less destructive than  
in the summer and autumn  
of the previous year, as they  
were abundant in the spring.  
there is no good reason why  
they should not have developed  
with an abundance of food,  
during the summer. Inher-  
itantly with the previous years  
Especially the Galeruska vittata



that matures at least two broods  
in a season. except the  
unfavourable climatic influences

In the extremely wet weather,  
and consequently great decomposition of vegetable matter,  
we find causes that from  
the commonly received opinions  
may have produced the epidemic  
among these insects. but at  
the same time if we admit  
that the disease was produced  
by the miasmatic or



the parasitic influence. we  
impelled with the fact that  
other insects no higher in the  
scale of being were entirely un-  
affected.

If miasma-mala-  
ria was the cause, then the  
question forces itself upon  
our consideration. why was  
the mosquito thus not only  
exempt, but at the same time  
developed in an unusual  
manner, insomuch that  
they were a source of -



annoyance almost beyond  
endurance, in many localities  
and these localities were the  
very places where the malarious  
influences are most manifest  
among men. as along the  
marshes and sloughs on the  
Mississippi river bottoms, there  
the mosquitoes became so  
abundant that there was  
no rest for man or beast  
either day or night. These  
reminding us forcibly of the



annoyances on the banks  
of the Orinoco and in the  
valley of the Amazon in  
South America.

These infested localities  
especially in the middle and  
southern parts of the State  
were greatly affected. at the  
same time with the mal-  
arial influences.

When we examine their  
physical organization. we  
find many points of similarity



The highest as well as  
the lowest animal or-  
ganizations are generation  
after generation. developed in  
the same manner from  
the union of parents similar  
to themselves. alike depend-  
ant upon food. and the  
common laws of life. diges-  
tion. and assimilation  
Similarly affected by the  
imponderable agents. light  
heat and electricity.



a normal presence of each  
being in the highest degree essen-  
tial to their development. While  
a great excess or deficiency in  
all cases. Without regard  
to type. produces death, thus  
they are all governed by  
many of the same laws  
that govern the production  
and sustenance of vegetable  
life. in these main roots of  
organized life the animal  
and vegetable kingdoms are.

10.



firmly implanted.

We see that in all the more  
essential conditions that  
govern the organic being  
the highest and the lowest  
animal organizations  
are upon a common plane.

Originated alike in Embryo  
developed alike in youth,  
propagating in a similar  
manner their kind at  
maturity, and all descending  
alike into one common



and unwelcome grave.  
Each struggling with all  
its powers to maintain  
the life it enjoys untill the  
last possible period of duration.

When we thus reflect on  
the great general laws that  
prevail among these different  
forms of organized beings,  
in every department of life,  
the nature of which we are  
conversant with, is it not  
more than we should attr



ourselves are they not sub-  
ject to the same pathological  
laws also. Then are they not  
subject to the same laws  
that direct the forces of this  
unknown agent called  
Malaria. If in every  
condition of life with  
which we are acquainted  
they are governed by the same  
laws. Would it be logical to  
suppose in this one unknown  
law that they are not alike



Subject to the same general  
principle? would it be reason-  
able to suppose that they are  
not in the presence of this.  
hypothetical something  
called malaria governed by  
a law of equal uniform  
application, so far as life  
grade will permit.

The very material difference  
presents itself for our con-  
sideration. The difference in  
the blood of different claps



## of animals

The present state of our knowledge of the action of the malarial poison in the blood is, that in a very remarkable manner it reduces the number of red capsules. Hence to some extent all animals having red blood, due weight being given to their susceptibility. powers of endurance, resistance and exposure



may become directly or indirectly influenced by this malarial agent.

But when we descend to the type of beings having white blood, we have no guide except reason and our own observations, the literature of the subject being very scanty. The diseases of white blooded animals up to the present time not having claimed much of



the attention of Pathologists.  
This may be, by many,  
considered a subject of  
very trivial importance or  
unworthy of notice, but  
to the true medical philos-  
opher, every thing connec-  
ted with the great problem  
of life, is worthy of the  
most careful consideration.  
The Pathologist here may  
find an open door to the  
demonstration of truth.



that heretofore have remained  
in utter obscurity.

Guided by reason and  
years of close observation, and  
study of the anatomy and  
Physiology of insects we  
must conclude that they  
are in many respects subject  
to common laws in rela-  
tion to health and disease,  
and that if one is affected  
by the malarial poison  
every other of the class may be.



That it really does or does  
not affect white blooded  
animals we do not know.

We do know that it  
has a marked influence  
on the red corpuscle,  
whether as a primary result  
from which the disease  
becomes manifest, or from  
its first affecting some  
other organ or function,  
and thus secondarily affect-  
ing the red corpuscle.



we not prepared to say

With our present knowledge, we can hardly admit that any other than red blooded animals are materially and sensibly influenced by the Malaria.

Close observation of insects and some of Malaria, at least, fails to give us any evidence that such an effect is produced. but on the contrary we have much to



aprove us that such is not  
the case.

Then as we can come  
to no other conclusion than  
that the same malaria  
which if it really influences  
one member of the great  
family of insects influences  
in a similar manner,  
every other member, the power  
of resistance &c. being held  
in consideration as temporary  
modifying causes.



Admitting then if we may  
for the purpose of arguing the  
question of a malarial poison  
as the cause of this Epidemic  
can we reconcile the apparent  
inconsistencies that arise.

Why did one species of the Hemich-  
tra lygaeus leucoptera suffer  
so terribly from its presence,  
while another species, of the same

order, the lygaeus already alluded  
to developed in such great and  
unusual numbers at the same  
a.







Others very abundant insects  
were enjoying the greatest immu-  
nity.

Of the Lepidoptera why  
were the Tinea Pomonella,  
the Thiny quinquemaculatus  
and many others greatly  
reduced in comparative numbers  
although in the previous year  
they were tenfold more abun-  
dant than I ever before  
observed, and in the spring  
and early summer, I saw in



a state of nature more of the  
manner of I. pomonella than I  
had seen in all my life  
before. and in the early spring  
I can say the same regarding  
I. quinque maculatus. The  
question urges itself with great  
force upon our consideration  
why were I. pomonella with  
such an army of progenitors  
no more abundant in numbers  
of the larva than in the proceed-  
ing year. and above all why



more the *L. quinque maculatus*  
so wonderfully decimated like  
*Lygus lineator* that not one  
reached the full grown larval state  
to a thousand of the previous year.  
At the same time many  
others especially the *Noctuidae* de-  
veloped to the perfect state in  
the greatest abundance.

Thus we might continue the  
comparison at much greater  
length. Among all the distinct  
orders of insects but many



unanswerable questions that  
arise. on the supposition that  
the so called malaria was  
the entire cause of the Epidemic.

If we suppose that the  
malaria instead of being evolu-  
ed by the decomposing vegeta-  
tion in marshes. is as many  
suppose, due to minute fungi  
produced in the dew, fog and  
vapours of the atmosphere. devel-  
oped in the night so small  
as to be beyond the reach of



the microscope. and dying  
in the light of the morning Sun,  
we still find ourselves in the  
same dilemma. in attempting  
to weave for ourselves a satisfac-  
tory answer to the question,  
that arises for our consideration,  
in connection with the subject  
of malarial poison as applied  
at least, to this particular  
epidemic

Even if this sub-micro-  
scopic fungi theory were established



of answering the conditions of  
the question at issue. would it  
be consistent a priori. in  
the first place to conjecture the  
existence of the fungi. In  
the second place to assume  
that these fungi are only  
in the locality of Marthes  
and that the spores are  
not driven in the winds to  
distant regions. while we  
know that there are much  
larger brytogamia. visible



to the naked eye, are at all  
times represented by these tho-  
sands everywhere, awaiting a  
proper receptacle for their  
development. Mushrooms,  
toadstools, lichens, mould  
plants, and the various fungi  
are abundant everywhere.  
Must they not enter the lungs  
in great numbers at every  
breath yet we are not con-  
scious of any deleterious results,  
and in the third place after



having ascertained the presence  
of these submicroscopic fungi.  
It becomes necessary to assume  
their poisonous character. Thus  
we have at least three complete  
suppositions for the purpose of  
hiding our ignorance. Each of  
which when compared with  
the test of known objects of  
the same class of the vegetable  
kingdom does not concur with  
any thing with which we are  
familiar. We cannot see



from with any power of the  
microscope at our command.  
When we have constructed  
our imaginary plant, we find  
it necessary to suppose the  
existence of a distinct,  
and separate law for its  
diffusion, and that the  
ordinary atmosphere laws  
do not exercise the usual  
control over it, wafting it to  
any portion of the Earth, and  
lastly we have been compelled



to construct it of a far  
more deadly poisonous character,  
than any other tangible member  
of the cryptogama. Each of  
which hypothesis, to say the  
least, is unreasonable. and  
after we have it. we have  
found above, that it will not  
answer all the requirements  
necessary to fulfill the conditions  
of a miasmatic poison, that  
operates upon the animal  
organization, as an agent



that we can raise to the  
rank of a general disease  
producing cause, in every  
department of the animal  
Kingdom.

The same argument applies  
with equal force against  
the cherished hypothesis for a  
legitimate origin of the various  
causes of the Eruptive fevers,  
a full discussion of which we must  
defer until we have completed the  
consideration of this division of our subject.



# Forces of Nature

The forces of Nature proper. Ultimate  
to the vaporized persons, are  
Capable of developing effects  
far more potent perhaps than  
we are capable of estimating.  
in the present state of Science.

The three imponderable  
agents light heat and electricity  
to which it may also be found  
necessary to add a fourth, the  
so-called all prevailing Ether,  
are conditions of the highest



vital importance to the development and maintenance of the organic being.

Without light the organizing forces are of the lowest order, and imperfect in development. All life in its origin and perpetuation is entirely dependent on the vitalizing influence of the rays of the Sun. (which many so sedulously exclude from their dwellings with blinds & curtains).

Only plants and animals



of the lowest types flourish  
at all successfully in dark  
situations, and we have good  
reason to believe that in perpetual  
darkness, with sufficient warmth,  
the vitalizing forces would soon  
cease entirely, and all life  
become forever obliterated.

The higher organizations,  
vegetable as well as animal,  
are very readily influenced by  
these circumstances.

I have frequently measured



the growing vine in a warm  
summer day advancing seven  
inches in 24 hours. of this,  
six inches grew between the rising  
and the setting sun leaving  
but one inch for the entire night  
and this grew in the twilight  
and early evening, under the  
remaining vitalizing influence  
of the departing light. in the  
morning, the growth had  
entirely ceased to be renewed  
again by the rising sun.



Now if the light of a day  
be modified by clouds, or if  
it be cold, the growth would  
be much less often, in midsum-  
mer, not one fourth as much  
as in clear light warm days.

Who is not familiar with  
the effect of partial darkness  
— that perpetual twilight,  
on vegetable life, in damp  
pits and cellars, as demon-  
strated in the feeble growth of  
potatoes &c. under the partial



Stimulating influence of  
the scattering rays of the  
sun. This effect is much  
more marked in the young  
growing, than in the already  
mature plant. It is so even  
in a higher degree with  
insects and all animals  
of the higher grades of organ-  
ization. In all ages of the  
worlds history from the earliest  
dawn of life we find the  
evidence of the vegetative force



as the forerunner of the  
animal, and existing under  
more primitive circumstances

We then here hope to find  
one of the auxiliary causes  
of this great epidemic among  
insects. The very season of  
their greatest need for the  
fullest influence of sunlight,  
was one of unusual dark-  
ness. day after day, it was  
wet and mostly cloudy  
for a period of three months



June, July and August  
past in the season of their  
development. Hence the  
vitalizing force was of a  
lower grade, the animal-  
ized cells, being developed  
up perfectly, are up able to  
maintain their organic  
identity in opposition to  
any disorganizing force a  
compatible contingency that  
may arise.

This view of the subject also



gives us a very plausible explanation of the comparative exemption of all these species, feeding on the tops of vegetation, already alluded to and the destruction of others.

The *Lygaeus leucopterus* especially in the larval state fed near the ground, and even on the root of plants, and therefore were less exposed to the light of the sun and more to the cold and dampness.



of the season, than insects  
in the tops of vegetables.

By way of a mare through  
upland. I had a few acres  
of barley, at full height, contiguous  
to a cornfield, ploughed under,  
with the millions of these  
larva, feeding around the  
roots. The heads of the barley  
projected from beneath the  
furrows, the intense wet  
weather preserved the life of  
the grain for about three weeks.



and to my surprise great numbers of these insects continued to live and develop under those exceedingly unfavourable circumstances. at length this supply failing them, those still alive resorted to the neighbouring corn. these were among the first to suffer from the epidemic on the highlands. They were as effectually exterminated, early, as those already referred to on the low lands.



While those on high lands  
under the more natural con-  
ditions, were able longer to resist  
the influence of the Epidemic  
causes — were attacked later  
and of these a few escaped  
the overwhelming calamity.

On the contrary Toryphora  
lineata feeds on the tops of  
the potato plant, on the very  
top of the stem and leaves.  
as I observed them  
during that wet season.

and therefore enjoyed more  
of the sunlight and breezes,  
and less exposure to cold and  
dampness during the day.

The same is true of *Chrysomela*  
*polypnia* already referred to, and  
many other exempt species.

While on the other hand the  
larva of *Saichnosterna fusca*  
and *Galerita vittata* feed  
on roots, just beneath the  
ground, and develop in a  
season when for a greater



portion of the time the surface of the ground for an inch or two is dry, freely impregnated with air, and under the direct influence of the sun light and warmth.

But in this unusually protracted season of cold and wet may we not have one of the efficient causes of their deterioration. Furthermore I observed the larvae of G. vittata feeding higher up on the root than usual. Now

above the surface of the ground,  
a thing which I had never seen  
before during seven years of close  
observation of their habits. This  
deviation from their usual habit  
of feeding, entirely beneath the  
surface of the ground. doubtless  
was to secure more of the sunlight  
and warmth, than their nat-  
ural feeding place afforded. and  
is conclusive evidence that the  
conditions essential to comfort  
and life were interfered with



and that these conditions were more nearly fulfilled on the surface of the ground, although the stem is not so naturally their appropriate food as the root. An humble evidence of making the best of inharmonious circumstances.

## HEAT

another condition within proper limits essential to the development of all life was here, also reduced below the

normal standard for the  
favourable development of  
these insects, and also had  
its effect in reducing the perfec-  
tion of the vital organization  
below its normal condition as  
they were developing, and  
was another of these circum-  
stances that prepared the way  
for the ultimate Epidemic.

Electricity that  
wonderful force so intimate-  
ly connected with every surround-  
ing



Subject is probably far more  
intimately connected with the  
great and mysterious problem  
of the creation, development  
and maintenance of the organic  
structure, than the more  
profound and scientific  
researches of the Philosopher.  
will admit in the present  
state of science, or even with  
the most creative imagination  
conceive. Many circumstan-  
ces interfere with its normal

development. Among  
these may be placed Clouds  
depriving the light of the sun  
for long periods of time.

The sun develops currents  
of electricity that traverse  
the earth from east to west.

These currents are greatly  
modified by the conditions  
of the atmosphere as extremes  
of wet cloudy weather di-  
minish the intensity while  
fine dry weather increases the



intensity of the Electrical  
current. We therefore have  
here at the same time corres-  
ponding modifications in the  
development of ozone - an  
intensified form of oxygen  
which is very essential to  
the maintenance of the in-  
tegrity of the organic structure.

This vitalizing force being  
diminished as well as the  
stimulation of the Electrical  
current not being manifested

in its usual quantity, or  
intensity. We have another  
cause of the diminution of  
the vital affinity, and  
consequent impairment  
of tonicities — vital adhesion  
in the cells of organic life,  
and consequently one of the  
direct causes instrumental  
in developing this Epidemic.



## Abnormal Atmospheric Conditions

The atmospheric conditions are very important elements of health and disease.

A dry climate with little carbonic acid gas is the best for the perfection of the animal organization.

The reverse is true of the vegetable kingdom. of this we have abundant evidence in the luxuriant and tangled forests of moist tropical regions.

and in the gigantic ferns  
of the Carboniferous era.

These wet seasons facilitate the decomposition of vegetable matter, and let off unusual quantities of carbonic acid gas, which operates beneficially on the animal system, in proportion to its increase.

The presence of an unusual quantity of water vapour in the atmosphere



is another very efficient  
cause of inconvenience  
and disease to animals.  
it prevents the freedom of the  
respiration from the skin,  
so essential to life, and  
materially interferes with the  
breathing apparatus.

Statistics prove that large  
bodies of water, with cold  
are fruitful causes of  
lung diseases. Rheumatism &c  
while high, dry inland warm  
No.

districts are comparatively  
free from the development  
of these diseases.

Now in the case of insects  
that have their lungs ramifying  
through every part of the body,  
with their imperfect blood  
circulation, we probably  
have here a more efficient  
disease producing cause  
than in the higher organized  
animals. The ripicles of  
watery vapour, condensing



the spiracles and minute  
air cells of these insects  
must greatly interfere with  
the proper oxidation of the  
blood, and in the S. leucophaea  
we have an insect living on  
& near the ground at a time  
in the year when the ground  
is much colder than the air,  
and consequently their bodies  
of a temperature corresponding  
with the ground night and  
day, as very many of the days

as we have seen mere hunks.  
The atmosphere being  
warmer than their bodies, and  
loaded to saturation with  
vapour would, at every  
inhalation, produce a conden-  
sation of water in their  
air passages. This continued  
for many days and nights  
in succession would seriously  
interfere with the essential  
blood purifying process.

This insect also feeds on



the sap of the plants,  
and therefore the mae needs  
the evaporating influence of  
a warm sunshine, and a  
dry atmosphere, than such  
insects as feed upon the  
more solid substance of plants,  
as the larva of several insects  
already referred to as being  
prominent examples of the  
exemption of a tender larva  
from the same epidemic.  
Hence as the season advances

we saw the epidemic raging  
more violently when the  
atmosphere became warmer  
and still more densely hei-  
ghted with watery vapour  
while the earth and necessarily  
the bodies of the insects still  
remained cool. The air par-  
ticles must of necessity become  
clogged with condensed vapour  
if not entirely filled with  
water. The blood is kept  
perfectly purified in proportion



as the water in the air  
cells and passages becomes  
more abundant.

The vitalizing force as we  
have already seen greatly deterior-  
ated by the deficiency of the  
creating power of the sunlight  
and heat. the lack of ozone  
and diminution of the necessary  
magnetic stimulus. the absence  
of tonicity in the already existing  
cell molecules. and imper-  
fect blood plasma from which

to elaborate the proper life organization; are influences under which we find the cell structure built up more and more imperfectly. The blood becomes poisoned with deteriorated organic materials. Near sick and emaciated the insect at length dies.

From the argument produced especially that which demonstrates that the trachea



And air cells of the insects  
were closed with condensed watery  
vapour it may perhaps be  
supposed that the cause of  
death was purely mechanical—  
a mere clogging and filling  
of the air passages so that  
they died of asphyxia and  
that they were not therefore diseased.  
That a low state of vital  
affinity or vital cohesion, if  
we may so style the peculiar force  
that holds the atoms of matter

with the power necessary to the  
persistent maintenance of the  
organic structure. in the midst  
of the opposing elements; must  
have existed we know from observa-  
tions of all the phenomena,  
bearing upon the question.

It certainly was not the  
mere presence of wet and cold  
that exhausted the life sustain-  
ing forces. As we have already stated  
the severe cold wet weather that  
the parents passed through on the



lump cold ground of Shring  
was not productive of any  
such results; like exposures are  
to be obtained every thing. and  
no such detrimental results  
occur. The simple reason is  
that a well developed healthy  
organization, — a condition of  
vital affinity where the organic  
coherence. and the vitalized forces  
existing in every cell are perfect;  
is capable of enduring more  
of the extreme variations of the  
S.

great pendulum of life  
favoring and life maintain-  
ing conditions than the low,  
depressed, deteriorated, imperfect  
state of vitality that we have  
found to exist in the objects of  
our consideration.

This low state of vitality is  
in all essential conditions the  
same whether it was induced in  
a previously healthy organization  
or as in this case, thus developed  
by the chemico physiological process.



as the organism was constructed. With this low degree of vitality the performance of the necessary life functions soon were interfered with, accumulations of effete matter in the system followed, upon the slightest provocation. The unfavourable conditions continued. The disorganizing tissues were not repaired as they most abundantly could not be, with this low degree of vital power, during the continuation of

the unfavourable surrounding conditions. From imperfection in organization and function, deep seated irreparable disease became established, without the interference of any foreign poisonous matter. The peculiar laws of nature surrounding and governing the functions of the organism engaged in the maintenance of the life forces, having thus departed from the normal and essential life conditions, we find a



deterioration of the already low  
vitalized cells. from the condition  
of life. to the other side of the  
great dividing line between the  
vital and the dead condition  
of organic matter, with an  
abnormal rapidity. hence we  
have the poisonous effects of  
excessive quantities of effete  
matter in the system. remaining  
so long as to undergo decompo-  
sition. whence we have the failing  
sinking, and collapse of death.

Thus from these circumstances we can see the production of an epidemic among a race fleeing with a negative state of vital affinity. While the same agencies and circumstances influencing the same individuals, under the protection of a positive state of vital affinity, would have produced no harm or serious inconvenience.

The lesson of the type of organization is no exemption.



from disease. however low  
the organization compared  
with the higher types of life there  
is still a great elevation above  
the mineral world. Where we  
find an organized living cell  
capable of reproducing its kind  
there may we find a standard  
of disease as well as health  
- of health while the proper relation  
of atom to atom is maintain-  
ed. and all the functions  
of life are properly performed.

Of disease, when the Chemico-Physiological forces, are no longer able to remove the disintegrating materials, as atom after atom dies in the ~~no~~ structures, at every vibration of the organic pendulum, as to repair the breach with material newly impregnated with the dynamic forces of the life giving power.

We are convinced that the Cause of death was truly a general disease of organic structure.



a vital affinity. and not a  
mere mechanical obstruction  
producing asphyxia. this becomes  
plain from the consideration of  
the fact that they were not all  
mortified at the same time,  
but died successively during  
a long period of time. as the  
functions of life gradually yielded  
to the destroying forces.  
These which from the many  
varying circumstances were  
in the condition first to take

the disease were first carried  
away. thus the disease progressed  
among them during a protracted  
period of time. in precisely the  
same way that human beings  
are struck down one after  
another by epidemic diseases,  
thus in low damp unfavour-  
able localities were first swept  
away also those under unpro-  
tected circumstances from  
any cause. as for example  
those ploughed under the ground



and compelled to live for a long time in these damp dark situations, even as it was on the high rolling prairie.

These circumstances are demonstrative that the agent working among them, was not merely of a miasmatic character, & indeed any cause except the ever present essential forces of nature. light heat Electricity food air and water. in their various modifications, were instru-

mental in producing the  
wonderful result.

We have thus shown that  
the disease was produced by a  
combination of causes. many of  
not all of which were modification  
of natural laws. — laws which  
acting under different degrees of  
intensity and circumstantial  
conditions are capable of devel-  
oping the highest degree of health.

We may here find a demon-  
strable law for the development of



disease as well as for the  
creation of worlds and their  
products. The Astronomer finds  
a mathematical law not only in  
the government of the revolutions  
of planets, suns and systems  
but in the creation of worlds  
innumerable. the Botanist  
in the structure of plants, the  
Zoologist in the physical organ-  
ization of the animal kingdom  
the Chemist in the combination  
and the Mineralogist in the arrange-  
ment.

of atoms. the Philosopher in  
cohesion. repulsion. inertia  
attraction. refraction. reflection  
radiation. undulation. Polarization &c.  
and the Geologist. in the develop-  
ment of life, and the perfection  
of the Earth throughout the  
entire formative period of our  
planet &c &c

If thus every department  
of Natural Science is based  
upon a mathematical  
foundation. May not the



Pathologist also find a mathematical law for the government of every disease, based on modulations and combinations of the essential laws of nature.

In light, heat, Electricity, food, air and water with their usual impurities, Hereditary vitality and age. We have the essential elements of health in their normal relations.

But when these normal

relations are modified as each one of them may be, in any degree. vibrating between zero on the one hand, and perfection, even infinity on the other. have we not, according to the laws of Permutations, the most endless variety of combinations, and causes of disease, without searching for abnormal agents, or special providences for the explanation of the cause of every epidemic or



or other disease, that develops.

With this view of the subject, it becomes as plain as the laws of nature are immutable, why disease is the unavoidable law, and perfect continued health, and eternal life in the flesh, the exception even to an improbability. This would be a pleasant subject to follow at greater length but must be abandoned at present in this connection.

Among the probable Causes  
most efficient as agents in the  
production of this great Epidemic,  
that involved the ruin of a race  
of beings that for numbers, far  
outweighed all the human beings  
that have lived on this planet,  
for the past 6000 years. together  
with all that will live during  
the next 100 000 years.

We have found.

- 1<sup>st</sup>. Deficient light
- 2<sup>d</sup>. Deficient heat



- 3<sup>d</sup>. Deficient Electricity
  - 4<sup>th</sup>. Excessive Moisture
  - 5<sup>th</sup>. The Earth much colder  
than the atmosphere
- all combined during the season of  
their decadence.

I have thus endeavoured  
faithfully to narrate what  
I considered a very important  
observation in the economy of  
nature, and to give my views  
of the pathological conditions  
and cause of the Epidemic

among these insects.

Beyond this we have not attempted to proceed in the classification of the disease, being content with states and conditions. We will refer the constitution of a name for the disease to other investigators. Those curious to know the names of the prevailing diseases among men during the height of this epidemic, August 1866. Can refer to the "Chicago Medical



Examiner Vol VII, No. 1 and  
institute such comparisons  
as they prefer.

I had hoped when entering  
upon this Essay, to find time  
and space for the discussion  
of other epidemics among  
animals. and to glance at  
those epidemics, that have  
hitherto, only, been considered  
worthy of notice. by writers on  
this subject; why? I am not  
able to comprehend; trace

they are associated with the  
life of our race. This is the  
strongest argument that we  
need to prove that epidemics  
among the race of human  
beings so personally interesting,  
yet when we look around us  
as naturalists, and behold  
that all our sources of profit—  
money-making, the all-engulfing  
one of  $\frac{999}{1000}$  of our race, would  
in a very brief space of time be  
swept away by the insect



hunger, in their multitudinous  
folds. Yea more. famine and  
to accompanying pestilence  
would desolate the land before  
the period of even our short lives  
should have been measured. Need  
it not for just such magnif-  
icent epidemics as I have narrated.

When we look at these things  
I am surprised that so little  
attention is given to such  
important results, results  
that hold the keys of our lives.

our fortunes and our all.  
Yet truly such have always  
been the imperfect notions of  
men. the maps even failing  
entirely to notice such "trifling  
things" and those who do  
observe them, not deeming  
them worthy of comment.  
We find the public journals  
filled with accounts of the  
great Cattle disease in Europe  
from which England alone  
has lost \$200,000,000 but



none of them even condescending  
to mention so trifling a thing  
as a disease among insects.  
that for the past 20 years have  
destroyed property in the valley  
of the Mississippi worth from  
\$5,000,000 to \$100,000,000 <sup>annually,</sup> W. A.  
and even threatened to ravage  
the entire North West.

In some of the journals also  
we notice remarks that  
abundance of noxious insects  
are fore-runners of Cholera &c.  
H.

While in reality the reverse is  
nearly the truth.

We often observe that in  
warm seasons insects are  
much more liable to disease.  
Who has not seen the com-  
mon house fly, afflicted with  
abdominal disease, in  
warm seasons, the abdomen  
bursting open and ad-  
hering to any object upon which  
the insect may be crawling.  
While it is yet alive and struggling



to become free. This was a  
common occurrence years ago,  
along the Atlantic coast, and  
regions east of the Alleghany  
Mountains.

But as I have already  
so far transgressed the  
limits proper for this essay  
we must defer the further  
consideration of this subject  
for a future essay.

